What is Claimed is:

1. A method of transmitting a plurality of signals from a common antenna, comprising:

(a) generating a first signal for transmission via a first transmit beam;

(b) generating a second signal for transmission via a second transmit beam;

(c) forming a composite signal that includes the first and second signals, wherein the phase of the composite signal accounts for signal modulation and beam forming characteristics of the first and second signals;

(d) supplying the composite signal to the common antenna; and

(e) transmitting the composite signal from the common antenna, thereby transmitting the first signal via the first transmit beam and transmitting the second signal via the second transmit beam.

2. The method of claim 1, wherein the first signal is different from the second signal.

3. The method of claim 1, wherein the first and second signals are transmitted at a common frequency.

4. The method of claim 1, wherein the first transmit beam is a Global Positioning System (GPS) earth coverage beam and the second transmit beam is a steerable GPS spot beam.

5. The method of claim 1, wherein the common antenna is a phased array antenna comprising an array of antenna elements, and wherein:

(c) includes forming a plurality of composite signals, wherein phases of the composite signals are a function of phases of respective antenna elements required to form the first and second transmit beams; and

(d) includes supplying the plurality of composite signals to the respective antenna elements of the phased array antenna.

6. The method of claim 5, wherein at least one of the first and second transmit beams is electronically steerable by adjusting phases of the composite signals.

7. The method of claim 5, wherein:

(a) includes forming a plurality of first modulated signals corresponding to antenna elements, and phase shifting the first modulated signals in accordance with phases of the antenna elements required to form the first transmit beam;

(b) includes forming a plurality of second modulated signals corresponding to antenna elements, and phase shifting the second modulated signals in accordance with phases of the antenna elements required to form the second transmit beam; and

(c) includes combining phase shifted first modulated signals with respective phase shifted second modulated signals to form the plurality of composite signals.

8. The method of claim 7, wherein (a) includes attenuating the phase shifted first modulated signals and (b) includes attenuating the phase shifted second modulated signals to control a distribution of power between the first and second transmit beams.

9. The method of claim 5, wherein (c) includes:

forming a plurality of digital composite signals corresponding to the respective antenna elements, wherein phases of the digital composite signals are a function of modulation of the first and second signals and phases of the respective antenna elements required to form the first and second transmit beams;

converting the digital composite signals to analog composite signals;

modulating carrier signals with the analog composite signals to form the plurality of composite signals.

10. The method of claim 9, wherein:

(a) includes determining phases of a plurality of first digital signals corresponding to the respective antenna elements, based on a modulation of the first signal and phases of the respective antenna elements required to form the first transmit beam;

(b) includes determining phases of a plurality of second digital signals corresponding to the respective antenna elements, based on a modulation of the second signal and phases of the respective antenna elements required to form the second transmit beam; and

(c) includes forming the plurality of digital composite signals based on the phases and amplitudes of the plurality of first and second digital signals.

11. The method of claim 10, wherein the digital composite signals are computed as a sum of the first and second digital signals.

12. The method of claim 10, wherein the digital composite signals are formed by interleaving the first and second digital signals.

13. The method of claim 9, wherein each of the plurality of composite signals is a constant envelope signal, the method further comprising:

(f) amplifying the plurality of composite signals using respective saturated high power amplifiers.

14. An apparatus for transmitting a plurality of signals, comprising:

a phased array antenna comprising an array of antenna elements; and

a transmitter system that receives a first signal for transmission via a first transmit beam and a second signal for transmission via a second transmit beam, the transmitter system forming a plurality of composite signals and supplying the plurality of composite signals to respective antenna elements of the phased array antenna, wherein phases of the composite signals are a function of signal modulations of the first and second signals and phases of the respective antenna elements required to form the first and second transmit beams;

wherein the phased array antenna transmits the first signal via the first transmit beam and transmits the second signal via the second transmit beam.

15. The apparatus of claim 14, wherein the first signal is different from the second signal.

16. The apparatus of claim 14, wherein the phased array antenna transmits the first and second signals at a common frequency.

17. The apparatus of claim 14, wherein at least one of the first and second transmit beams is electronically steerable by adjusting phases of the composite signals.

18. The apparatus of claim 14, wherein the apparatus is a Global Positioning System (GPS) satellite, and wherein the first transmit beam is a GPS earth coverage beam and the second transmit beam is a steerable GPS spot beam.

19. The apparatus of claim 14, wherein the transmitter system further comprises:

a first power splitter that produces a plurality of first modulated signals from the first signal;

a first array of phase shifters that phase shift the first modulated signals in accordance with phases of the respective antenna elements required to form the first transmit beam;

a second power splitter that produces a plurality of second modulated signals from the second signal;

a second array of phase shifters that phase shift the second modulated signals in accordance with phases of the respective antenna elements required to form the second transmit beam; and

a combiner that combines the phase shifted first modulated signals with respective phase shifted second modulated signals to form the plurality of composite signals.

20. The apparatus of claim 19, further comprising a first array of attenuators that attenuate the first modulated signals and a second array of attenuators that attenuate the second modulated signals to control a distribution of power between the first and second transmit beams.

21. The apparatus of claim 19, further comprising an array of linear amplifiers that respectively amplify the plurality of composite signals.

22. The apparatus of claim 14, wherein the transmitter system further comprises:

a processor that forms a plurality of digital composite signals corresponding to the respective antenna elements, wherein phases of the digital composite signals are a function of modulation of the first and second signals and phases of the respective antenna elements required to form the first and second transmit beams;

an array of digital-to-analog converters that convert the digital composite signals to analog composite signals; and

an array of signal modulators that modulate carrier signals with the analog composite signals to form the plurality of composite signals.

23. The apparatus of claim 22, wherein the processor:

determines phases of a plurality of first digital signals corresponding to the respective antenna elements based on a modulation of the first signal and phases of the respective antenna elements required to form the first transmit beam;

determines phases of a plurality of second digital signals corresponding to the respective antenna elements based on a modulation of the second signal and phases of the respective antenna elements required to form the second transmit beam; and

forms the plurality of digital composite signals based on the phases and amplitudes of the plurality of first and second digital signals.

24. The apparatus of claim 23, wherein the processor computes the digital composite signals as a sum of the first and second digital signals.

25. The apparatus of claim 23, wherein the processor forms the digital composite signals by interleaving the first and second digital signals.

26. The apparatus of claim 22, wherein each of the plurality of composite signals is a constant envelope signal, the apparatus further comprising:

an array of saturated high power amplifiers that respectively amplify the plurality of composite signals.

27. An apparatus for transmitting a plurality of signals, comprising:

a phased array antenna comprising an array of antenna elements; and

means for forming a plurality of composite signals from a first signal and a second signal, and for supplying the plurality of composite signals to respective antenna elements of the phased array antenna for transmission, wherein phases of the composite signals are a function of signal modulations of the first and second signals and phases of the respective antenna elements required to transmit the first signal via a first transmit beam and to transmit the second signal via a second transmit beam.